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10/711,262

09/07/2004

Soichiro Okubo

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03/06/2006

EXAMINER

CHAPEL, DEREK S

JUDGE PATENT FIRM

RIVIERE SHUKUGAWA 3RD FL.

3-1 WAKAMATSU-CHO

NISHINOMIYA-SHI, HYOGO, 662-0035

JAPAN

ART UNIT

PAPER NUMBER

2872

DATE MAILED: 03/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/711,262

Applicant(s)

OKUBO ET AL.

Examiner

Derek S. Chapel

Art Unit

2872

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 11, 12, 22-26 and 28-32 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 11, 12, 22, 24-26, 28-30 and 32 is/are rejected.
- 7) ☒ Claim(s) 23 and 31 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☒ Certified copies of the priority documents have been received in Application No. 10/065,738.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Status of Claims

1. Claims 11-12, and 22-26 are still pending, claims 1-10, 13-21, and 27 have been cancelled, and claims 28-32 are newly added. It is further noted that claims 11, 12, and 22-24, which were previously indicated as allowable, have been rejected in view of the newly discovered reference(s) to Brady et al. (U.S. Patent No. 5,294,518) and Zhang et al., *Structural modification of polymeric amorphous hydrogenated carbon films induced by high energetic He⁺ irradiation and thermal annealing*, Vol. 9, 2000, pp. 1758-1761, of record.

Specification

2. The disclosure is objected to because of the following informalities:
- a. 'diamond-like carbon' should be changed to --diamond-like carbon (DLC)-- in line 3 of paragraph 23;
 - b. 'CVD' should be changed to --chemical-vapor-deposition (CVD)-- in line 3 of paragraph 45;
 - c. 'silicon oxide' and 'titanium oxide' should be changed to --silicon dioxide-- and --titanium dioxide-- respectively in all instances in paragraphs 51, 55, and 56;
 - d. 'DCL' should be changed to --DLC-- in line 3 of paragraph 102.
- Appropriate correction is required.

Claim Objections

3. Claims 11-12, 22-24, and 28-32 are objected to because of the following informalities:
- a. 'DLC film' in line 2 of claim 11 should be changed to --diamond-like carbon (DLC hereafter) film--;
 - b. 'A DLC film' at the beginning of claims 12, 22-24, and 28-32 should be changed to --The DLC film--;
 - c. 'DCL' should be changed to --DLC-- in line 3 of claims 28, 29, and 30.
 - d. 'a hydrogen-containing DLC film, a nitrogen-containing DLC film, and a non-hydrogen-containing, non-nitrogen-containing DLC film' should be changed to --a hydrogen-containing DLC film; a nitrogen-containing DLC film; and a non-hydrogen-containing, non-nitrogen-containing DLC film-- for clarity.
4. Claim 11 recites the limitation "the refractive index" in line 3 of claim 11. There is insufficient antecedent basis for this limitation in the claim.
5. Claim 25 recites the limitation "the plane" in line 2 of claim 25. There is insufficient antecedent basis for this limitation in the claim.
6. Claim 26 recites the limitation "the thickness" in lines 2 and 3 of claim 26. There is insufficient antecedent basis for this limitation in the claim.

Appropriate correction is required for the above objections.

Double Patenting

7. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

8. Claims 11 and 12 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4, 6, and 7 of U.S. Patent No. 6,813,076 in view of Zhang et al., *Structural modification of polymeric amorphous hydrogenated carbon films induced by high energetic He⁺ irradiation and thermal annealing*, Vol. 9, 2000, pp. 1758-1761 (hereafter Zhang), of record.

Okubo et al., U.S. Patent No. 6,813,076 (hereafter Okubo), of record, claims a method of qualitatively transforming a diamond-like carbon (hereafter DLC) film, the method comprising the step of irradiating with either a particle beam or an energy beam at least one region of the DLC film (See claims 4 and 6). Okubo further claims that said particle beam is one selected from the group consisting of an ion beam, an electron

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beam, a proton beam, α -rays, or a neutron beam (See claim 4 and 6); and said energy beam is one selected from the group consisting of light rays, X-rays, or γ -rays (See claims 4, 6, and 7).

Okubo lacks raising a refractive index of that region, whereby a distributed refractive index structure is created within the DLC film.

However, Zhang discloses a method comprising the step of irradiating with either a particle beam or an energy beam (See Section 1 on Page 1758) at least one region of the DLC film (See Section 2, Col. 1 on Page 1759) to raise a refractive index of that region (See Section 3 on Pages 1759-1760 and Fig. 2), whereby a distributed refractive index structure is created within the DLC film (See Sections 2 and 3 on Page 1759, wherein Zhang discloses an "irradiated area" meaning that there is an area that is irradiated and there is an area that isn't irradiated which forms a distributed refractive index structure).

Therefore, it would have been obvious to someone of ordinary skill in the art at the time the invention was made to modify the claimed method of Okubo to further include raising the refractive index of the region, whereby a distributed refractive index structure is created within the DLC film, as taught by Zhang, for the purpose of adjusting the optical (e.g. refractive index, extinction coefficient), as well as mechanical/physical (e.g. hardness, color), properties of the film based on its intended application.

9. Claim 24 is rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 4 and 6 of Okubo in view of Zhang.

As stated above, Okubo in view of Zhang teach the combination of limitations of claim 11, wherein the DLC film is irradiated with either the particle beam or the energy beam at a bias with respect to the film's thickness (See Section 2 on Page 1759 of Zhang, wherein Zhang discloses that the irradiation was performed at an incidence angle of 12 degrees with respect to the normal).

Okubo in view of Zhang does not teach that the distributed refractive index structure is created sloping with respect to the film's thickness.

However, although claims 4 and 6 of Okubo do not disclose that the distributed refractive index structure is created "sloping" with respect to the film's thickness, the claim does disclose irradiating with a particle or energy beam at a bias with respect to the film's thickness. Additionally "bias" is further defined and shown in Col. 9, Lines 22-30 as well as in Figure 10 of Okubo. In particular, Figure 10 clearly shows the "bias" as forming a "sloping" refractive index with respect to the film's thickness.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the claimed method of Okubo to further have the distributed refractive index structure be created "sloping" or "biased", with respect to the film's thickness, for the purpose of facilitating the characterization of the various optical properties (e.g. refractive index, extinction coefficient) of the formed DLC film.

Claim Rejections - 35 USC § 102

10. Claims 11-12, 22, 24-26, 28-30, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Brady et al., (U.S. Patent No. 5,294,518, hereafter Brady).

11. As to claim 11, Brady discloses a method comprising the step of irradiating with either a particle beam or an energy beam (See Col. 4, Lines 1-10) at least one region of a DLC film to raise the refractive index of that region (See Col. 4, Lines 29+ and Figure 1), whereby a distributed refractive index structure is created within the DLC film (See Col. 6, Lines 24+ and Figure 2).

12. As to claim 12, Brady discloses the combination of claim 11, wherein said particle beam is one selected from the group consisting of an ion beam, an electron beam, a proton beam, α -rays, or a neutron beam; and said energy beam is one selected from the group consisting of light rays (See Col. 4, Lines 1-10), X-rays or γ -rays.

13. As to claim 22, Brady discloses the combination of claim 11, wherein the qualitative transformation is carried out on one selected from the group consisting of a hydrogen-containing DLC film; a nitrogen-containing DLC film; and a non-hydrogen-containing, non-nitrogen-containing DLC film (See Col. 7, Lines 50-58 and Figure 4).

14. As to claims 24 and 26, Brady discloses the combination of claim 11, wherein the DLC film is irradiated with either the particle beam or the energy beam at a bias with respect to the film's thickness, whereby the distributed index structure is created sloping with respect to the film's thickness (See Figure 3). It is noted that "bias" and "sloping" are interpreted to include an infinite slope (e.g. an energy beam directed perpendicular to the film's thickness as shown in figure 3), since no range is given.

15. As to claims 25, 28-30, and 32, Brady discloses a film-transforming method as set forth above in claims 11, 12, 22, and 24, wherein there is a DLC film having refractive indices distributed in a pattern oriented within a plane of the film (See Col. 6,

Lines 24+ and Figure 2), the DLC film including a plurality of qualitatively transformed regions in which the refractive indices are changed (See Col. 4, Lines 29+ and Col. 6, Lines 24+ and Figure 2).

16. Claims 11, 12, 22, 24, 26, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang.

17. As to claim 11, Zhang discloses a method comprising the step of irradiating with either a particle beam or an energy beam (See Section 1 on Page 1758) at least one region of a DLC film to raise the refractive index of that region (See Section 3, Col. 2 on Page 1759 and Col. 1 on Page 1760), whereby a distributed refractive index structure is created within the DLC film (See Sections 2 and 3 on Page 1759, wherein Zhang discloses an "irradiated area" meaning that there is an area that is irradiated and there is an area that isn't irradiated which forms a distributed refractive index structure).

18. As to claim 12, Zhang discloses the combination of claim 11, wherein said particle beam is one selected from the group consisting of an ion beam (See Section 1 on Page 1758), an electron beam, a proton beam, α -rays, or a neutron beam; and said energy beam is one selected from the group consisting of light rays, X-rays or γ -rays.

19. As to claim 22, Zhang discloses the combination of claim 11, wherein the qualitative transformation is carried out on one selected from the group consisting of a hydrogen-containing DLC film (See Section 1 on Page 1758); a nitrogen-containing DLC film; and a non-hydrogen-containing, non-nitrogen-containing DLC film.

20. As to claim 24, Zhang discloses the combination of claim 11, wherein the DLC film is irradiated with either the particle beam or the energy beam at a bias with respect

to the film's thickness (See Col. 1 of Section 2 on Page 1759), whereby the distributed index structure is created sloping with respect to the film's thickness (This is inherent since the ion implantation is done at a bias, 12 degrees, from the normal of the film's thickness creating a sloped area with a raised index of refraction).

21. As to claim 26, Zhang discloses a DLC film having refractive indices distributed in a pattern (See Col. 1 of Section 2 and Col. 2 of Section 3 on Page 1759, both sections refer to an "irradiated area" meaning that there is an area that is irradiated and there is an area that isn't irradiated which forms an arbitrary pattern) oriented on a bias with respect to a thickness of the film (This is inherent since the ion implantation is done at a "bias" or angle, see column 1 of section 2 on page 1759, from the normal of the film's thickness creating a "sloped" area with a raised index of refraction).

22. As to claim 32, Zhang discloses the combination of claims 24 and 11, wherein a distributed refractive index pattern is created by a film-transforming method (See Col. 1 of Section 2 and Col. 2 of Section 3 on Page 1759, both sections refer to an "irradiated area" meaning that there is an area that is irradiated and there is an area that isn't irradiated which forms an arbitrary pattern)

Claim Rejections - 35 USC § 103

23. Claims 25, 28, 29, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang.

Zhang discloses a DLC film having refractive indices distributed in a pattern oriented within a plane of the film (See Col. 1 of Section 2 and Col. 2 of Section 3 on

Page 1759, both sections refer to an "irradiated area" meaning that there is an area that is irradiated and there is an area that isn't irradiated which forms an arbitrary pattern) using the DLC film-transforming methods as set forth in claims 11, 12, and 22.

Zhang does not disclose that the DLC film includes a plurality of qualitatively transformed regions in which the refractive indices are changed.

Though Zhang specifically teaches that at least one region of the film may be irradiated, it would have been evident and obvious to one of ordinary skill to irradiate more than one region of the DLC film. It is also noted that Zhang does not preclude more than one area being irradiated to change the refractive indices of the plural regions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to create a plurality of qualitatively transformed regions in which the refractive indices are changed on a DLC film for the purpose of facilitating the testing of different areas to determine characteristics, after irradiation, or to test if using different irradiation doses on separate sections causes more desired changes in the DLC's properties.

Allowable Subject Matter

24. It is first noted, the indicated allowability of claims 11, 12, and 22-24 is withdrawn in view of the newly discovered prior art. Rejections based on the newly cited reference(s) are stated above.

25. Claims 23 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

26. The following is a statement of reasons for the indication of allowable subject matter:

The prior art taken alone or in combination, fails to teach or fairly suggest a DLC film characterized by having a distributed refractive index pattern created by a film-transforming method carried out on a DLC film having a refractive index smaller than 1.6 and an extinction coefficient smaller than 1×10^{-3} with respect to light within a wavelength range of 550nm as recited in claims 23 and 31.

Response to Arguments

27. Applicant's arguments with respect to claims 25 and 26 have been considered but are moot in view of the new ground(s) of rejection. It is noted that claim 27 has been cancelled.

Other Related Art

28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

29. Klyui et al., *Nitrogen-Doped DLC Films: Correlation between Optical and Mechanical Properties*, Vol. 5, April 1997, pp. 341-347 (hereafter Klyui) discloses

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irradiating DLC films with nitrogen ions during the film growth and after the film deposition which raises the refractive index of the film.

Conclusion

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Derek S. Chapel whose telephone number is 571-272-8042. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew A. Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Derek Chapel

DSC
2/24/2006



DREW A. DUNN
SUPERVISORY PATENT EXAMINER